

AGRICULTURE AND NATURAL RESOURCES

475*. **International Studies in Agriculture and Natural Resources**
 Fall, Spring, Summer. 2 to 6 credits.
 May reenroll for a maximum of 6 credits.
 R: Approval of college; application required.
 Study-travel experience emphasizing contemporary problems affecting agriculture and natural resources in the world, national and local communities. Case studies and interviews with officials, community leaders and leading professionals.
 QA: ANR 475

481*. **Agricultural Research Systems in Developing Countries**
 Summer. 2(2-0) Interdepartmental with the Department(s) of Agricultural Economics, Animal Science, Crop and Soil Sciences.
 R: Open only to seniors and graduate students in the College of Agriculture and Natural Resources.
 Planning, organizing and managing agricultural research systems. Problems and alternative reforms to improve research productivity. Adapting new agricultural technology in developing countries.
 QA: ANR 480

489*. **Integrated Approaches to Agriculture and Natural Resources Problems**
 Fall, Spring. 3(2-2)
 P: MTH 110 or MTH 116; EC 201 or EC 202. R: Open only to seniors in the College of Agriculture and Natural Resources.
 Holistic solutions to resource management and allocation emphasizing an integrated, multidisciplinary team approach to case study problems.
 QP: MTH 109 ORMTH 110ORMTH 111

491*. **Selected Topics**
 Fall, Spring, Summer. 1 to 4 credits.
 May reenroll for a maximum of 6 credits.
 R: Not open to freshmen and sophomores
 Special topics in agriculture and natural resources.
 QA: ANR 480

493*. **Professional Internship in Agriculture and Natural Resources**
 Fall, Spring, Summer. 3(-) May reenroll for a maximum of 6 credits.
 R: Open only to juniors and seniors in the College of Agriculture and Natural Resources. Approval of department; application required.
 Supervised professional experiences in agencies and businesses related to student's major field of study.
 QA: ANR 399

AMERICAN STUDIES AMS

491*. **Perspectives in American Studies**
 Fall. 3(3-0) May reenroll for a maximum of 6 credits.
 R: juniors-seniors
 Methods and significant works in American Studies for majors.
 QA: AMS 410

492*. **Seminar in American Studies**
 Spring. 3(3-0) May reenroll for a maximum of 6 credits.
 R: Juniors and seniors Arts and Letters, James Madison
 Seminar approach to selected topics in American life emphasizing interdisciplinary approaches. Topics vary.
 QA: AMS411

881*. **American Studies Theory, Methods, Bibliography**
 Fall. 3(3-0)
 R: Graduate Arts & Letters American Studies
 Methods and bibliographical sources of American Studies research. Interdisciplinary approaches to studying American culture.
 QA: AL 801

890*. **Independent Study**
 Fall, Spring, Summer. 1 to 4 credits.
 May reenroll for a maximum of 12 credits.
 R: Approval of the program director
 Special projects, directed reading, and research arranged by an individual graduate student and a faculty member in areas supplementing regular course offerings.
 QA: A L 803

891*. **Special Topics in American Studies**
 Fall, Spring, Summer. 4(04-00) May reenroll for a maximum of 12 credits.
 R: Approval of the program director
 Special topics supplementing regular course offerings proposed by faculty on a group study basis for graduate students.
 QA: A L 802

899*. **Master's Thesis Research-Plan A**
 Fall, Spring, Summer. 1 to 6 credits.
 May reenroll for a maximum of 6 credits.
 R: Approval of the program director
 Directed research leading to a master's thesis, used in partial fulfillment of plan A master's degree requirements.

AMERICAN THOUGHT AND LANGUAGE ATL

There will be 4 credit Tier One writing courses numbered ATL 110 and higher.

There will be a 4 credit Honors Tier One course numbered ATL 195H.

There will be a developmental Tier One writing course.

ANATOMY ANT

316*. **General Human Anatomy**
 Spring. 3(-)
 P: BS 211 or BS 212 R: Approval of Department
 Designed to impart the basic concepts of the broad field of anatomy. Special requirements of the various disciplines will be met in their respective laboratories.
 QP: BS 211 BS 212 QA: ANT 316

515*. **Comparative Veterinary Gross Anatomy**
 Fall. 6(2-10)
 P: Admission to the College of Veterinary Medicine R: College of Veterinary Medicine Veterinary Medicine none
 Essentials of canine anatomy with comparisons to ruminant, porcine and equine anatomy.

516*. **Veterinary Histology and Cell Biology**
 Fall. 4(3-2)
 P: Admission to the College of Veterinary Medicine. R: College of Veterinary Medicine
 Introduction to the principles of developmental, cellular, and molecular biology relevant to future courses in the veterinary curriculum.

517*. **Veterinary Neuroanatomy**
 Spring. 1(1-0)
 P: Admission to the College of Veterinary Medicine. R: College of Veterinary Medicine Veterinary Medicine none
 Introduction to the anatomy of the canine nervous system.

551. **Medical Gross Anatomy**
 Fall. 7(4-6)
 R: Graduate-professional students in colleges of Human and Osteopathic Medicine.
 Gross anatomy of the human body using prosections, medical imaging, clinical correlations, case studies, video tapes, and computer aided instruction.

552. **Medical Neuroscience**
 Spring. 4(3-2) Interdepartmental with the Department(s) of Physiology, Radiology.
 R: Graduate-professional students in colleges of Human and Osteopathic Medicine.
 Correlation of normal structure and function of the human nervous system with clinical testing, classical lesions, and common diseases.

562. **Medical Histology**
 Spring. 3(2-2)
 R: Graduate-professional students in colleges of Human and Osteopathic Medicine.
 Histology of the human body.

585. **Human Gross Anatomy Dissection**
 Fall, Spring, Summer. 2 to 7 credits.
 May reenroll for a maximum of 15 credits.
 P: ANT 551 R: Graduate-professional students in colleges of Human and Osteopathic Medicine.
 Dissection of selected regions of the human body.

802*. **Clinical Surgical Anatomy**
 Spring. 6(04-04) Interdepartmental with the Department(s) of Surgery.
 P: Must be a surgery resident with MD or DO C: Must be in the MSU system
 Review of surgical anatomy; the opportunity to obtain detailed anatomical information through lecture and dissection sessions; and the clinical interpretation of anatomy surgical approaches.

813*. **Problems in Anatomy**
 Fall, Spring, Summer. 1 to 5 credits.
 May reenroll for a maximum of 5 credits.
 P: Approval of department
 Various anatomical fields such as gross anatomy, histology, tissue culture, cytology, neurology and embryology will be studied
 QA: ANT 813

814*. **Graduate Student Seminar**
 Spring of even-numbered years. 1 to 3 credits.
 R: Anatomy graduate program
 Supervised practice in delivering and evaluating written abstracts and public oral presentations of anatomical sciences, techniques or organization, timing and effective illustrations
 QA: ANT 814

820*. **Advanced Neuroanatomy**
 Summer of odd-numbered years. 1 to 3 credits. May reenroll for a maximum of 99 credits.
 P: Permission of instructor
 Current topics concerning anatomy and physiology of CNS cells and their processes
 QP: ANT 815 QA: ANT 820

ANATOMY

839*. **Systems Neuroscience**
Spring of odd-numbered years.
4(04-00) Interdepartmental with the Department(s) of Pharmacology and Toxicology, Physiology.

Anatomy, Pharmacology and physiology of multicellular neural systems, including major sensory, motor, autonomic and chemo-regulatory systems in brains of vertebrates.

885*. **Vertebrate Neural Systems**
Spring of odd-numbered years.
3(02-02) Interdisciplinary with the Department(s) of Physiology.

Comparative analysis of major component systems of vertebrate brains, their evolution, ontogeny, structure and function in fish, amphibians, reptiles, birds and mammals
 QA: ANT 885 ANT 886

899*. **Master's Thesis Research**
Fall, Spring, Summer. 1 to 12 credits.
P: Admission to M.S. degree program in Anatomy R: Anatomy

QA: ANT 899

999*. **Doctoral Dissertation Research**
Fall, Spring, Summer. 1 to 12 credits.
P: Admission to Ph.D. program in Anatomy R: Anatomy

QA: ANT 999

ANIMAL SCIENCE ANS

110. **Introductory Animal Agriculture**
Fall. 3(2-2)

History of animal agriculture and its relationship to human needs, production systems, marketing, environmental considerations. Current goals of and limitations affecting U.S. animal production.
 QP: ANS 211

112. **Introductory Animal Management**
Spring. 3(2-2)
P: ANS 110.

Principles of managing beef and dairy cattle, horses, poultry, sheep and swine throughout their life cycles. Topics include genetics, nutrition, reproduction, health, care, and economically efficient production.

210*. **Animal Products**
Fall. 4(3-3)
P: ANS 110, ANS 112. R: Not open to freshmen.

Edible animal products. Processing, preservation, storage and distribution of dairy, meat, and egg products.
 QP: ANS 110 ANS 211 QA: ANS 156 FSC 300

211. **Animal and Product Evaluation**
Spring. 3(1-6)

Fundamentals of animal and product evaluation. Skeletal and muscular anatomy of animals and its relation to function. Oral and written defense of decisions regarding evaluation.

212*. **Merchandising Purebred Livestock**
Spring of odd-numbered years. 2(1-2)
R: Open only to sophomores, juniors, and seniors.

Purebred livestock industry. Private treaty and auction sales. Advertising, animal selection and budgeting of purebred livestock sales. Field trips required.
 QA: ANS 318

262*. **Sheep Management**
Spring. 3(2-2)
R: Open only to sophomores, juniors, and seniors.

Principles of sheep management: genetics, reproduction, nutrition, marketing, and economics. Field trips required.
 QA: ANS 472

300A*. **Livestock Judging**
Fall of even-numbered years. 2(-)
P: ANS 211. R: Open only to juniors and seniors.

Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition. Field trips required.
 QP: ANS 357A ANS 357B QA: ANS 357C

300B*. **Meat Evaluation and Grading**
Fall of odd-numbered years. 2(-)
P: ANS 211. R: Open only to juniors and seniors.

Evaluation of beef, pork, and lamb carcasses and wholesale cuts according to industry standards. Federal grading standards. Field trips to meat packing operations required. Represent MSU in intercollegiate competition.
 QP: ANS 257A QA: ANS 257B

300C*. **Dairy Cattle Judging**
Fall. 2(-)
P: ANS 211. R: Open only to juniors or seniors.

Evaluation of conformation of various breeds of dairy cattle. Represent MSU in intercollegiate competition. Field trips required.
 QP: ANS 211 QA: ANS 337

300D*. **Horse Judging**
Fall. 2(-)
P: ANS 211. R: Open only to juniors and seniors.

Evaluation of functional characteristics of horses. Development of oral reasons. Represent MSU in intercollegiate competition. Field trips required.
 QP: ANS 347A QA: ANS 347B

310*. **Livestock and Product Marketing**
Fall. 3(2-2) Interdepartmental with the Department(s) of Agricultural Economics.
P: ANS 112 R: Sophomores and above

Movement of livestock into and products through market channels. Market structures, futures, options and current issues. Field trip required.
 QP: ANS 110 ANS 152 QA: ANS 418

313*. **Principles of Animal Feeding and Nutrition**
Fall. 4(3-2)
P: CEM 143, PSL 250.

Principles and practices of nutrition for cattle, horses, poultry, sheep and swine. Metabolism of protein, minerals, and vitamins. Diet formulation. Performance prediction. Nutritional maladies. Field trip required.
 QP: CEM 143 PSL 241 QA: ANS 313A ANS313B

314*. **Genetic Improvement of Farm Animals**
Fall. 4(3-2)
P: ANS 110, MTH 116. R: Not open to freshmen and sophomores.

Qualitative and quantitative inheritance in domestic farm animals. Statistical concepts and probability related to animal breeding. Improvement of dairy cattle, livestock, and horses through genetics and mating systems.
 QP: ANS 110 MTH 109ORMTH 110OR QA: ANS 314

315*. **Anatomy and Physiology of Farm Animals**
Spring. 4(3-2)
P: ANS 112, PSL 250.

Gross and microanatomy of farm animals. Structure directed function of tissues. Endocrine integration for homeostasis. Regulation of growth, lactation, and reproduction. Homeorhesis.
 QP: ANS 211 PSL 241 QA: ANS 315

401*. **Issues in Animal Agriculture**
Spring. 1(1-0)
P: ANS 313 or ANS 314 or ANS 315. R: Open only to seniors.

Societal issues related to local, national and international animal agriculture.
 QP: ANS 313AORANS 313BORANS 314 QA: ANS 310

405*. **Endocrinology of Reproduction**
Fall. 3(3-0)
P: ANS 315; BCH 200 or BCH 401. R: Not open to freshmen and sophomores.

Endocrine regulation of reproduction. Cellular and molecular aspects of gametogenesis, folliculogenesis, sexual cycles, fertilization, sex differentiation, gestation, and parturition. Technology to regulate reproduction.
 QP: PSL 241 ANDBCH 200ORBCH 401 QA: ANS 455

407*. **Food and Animal Toxicology**
Fall. 3(3-0) Interdepartmental with the Department(s) of Food Science.
P: BCH 200 or BCH 401 R: Juniors and above

Fate and effects of chemicals in the food chain including impact on animal production, residues in food products, food safety assessment, and control methods.
 QP: BCH 200 ORBCH 401 QA: ANS 413A

407L*. **Toxicology Methods Laboratory**
Fall. 2(0-4) Interdepartmental with the Department(s) of Food Science.
P: ANS 407 or concurrently R: Juniors and above

Laboratory techniques for evaluating potential toxicity of chemicals to living systems. Field trip to industrial toxicology laboratory required.
 QP: ANS 413A QA: ANS 413B

410*. **Critical Analysis of Issues in Animal Science**
Fall. 2(2-0)
P: ANS 313 or ANS 314 or ANS 315. R: Open only to seniors.

Traditional animal management practices and evolving technologies. Topics will vary each year.
 QP: ANS 313 ORANS 314ORANS 315

413*. **Non-Ruminant Nutrition**
Spring. 4(3-2)
P: ANS 313. R: Not open to freshmen and sophomores.

Nutrition of horses, swine and poultry. Digestive and metabolic development and nutrient requirements. Relationships of genetics, endocrinology, immunology, and environment to nutrition.
 QP: ANS 313B QA: ANS 483 ANS 463

414*. **Advanced Animal Breeding and Genetics**
Spring. 4(3-2)
P: ANS 314. R: Not open to freshmen and sophomores.

Application of genetics to animal breeding. Current and potential selection programs and crossbreeding systems of dairy cattle, horse and livestock populations. Expected response to selection methods.
 QP: ANS 314 QA: ANS 454 ANS 434